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10/539,909

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Daniel Gary

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AIR LIQUIDE

Intellectual Property

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HOUSTON, TX 77056

EXAMINER

MERKLING, MATTHEW J

ART UNIT

PAPER NUMBER

1764

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DELIVERY MODE

09/06/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

| | | | |
|------------------------------|---------------------------------|-----------------------------|--|
| Office Action Summary | Application No. 10/539,909 | Applicant(s) GARY ET AL. | |
| | Examiner Matthew J. Merkling | Art Unit 1764 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 June 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 26-61 is/are pending in the application.
- 4a) Of the above claim(s) 55-61 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 26-54 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date <u>6/16/05</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Restriction is required under 35 U.S.C. 121 and 372.

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1.

In accordance with 37 CFR 1.499, applicant is required, in reply to this action, to elect a single invention to which the claims must be restricted.

Group I, claim(s) 26-54, drawn to a method.

Group II, claim(s) 55-61, drawn to an apparatus.

2. The inventions listed as Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: Group II contains an accelerating means which is not contained in Group I and does not appear to be contained in the prior art.

3. During a telephone conversation with Elwood Haynes on 8/22/07 a provisional election was made to prosecute the invention of Group I, claims 26-54. Affirmation of this election must be made by applicant in replying to this Office action. Claims 55-61 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

4. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Information Disclosure Statement

5. The examiner considered the international search report (PCT/FR03/050168) but lined through it as it is not a published document available to the public and will not be listed on the face of the patent if one is to be issued.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. Claims 26- are rejected under 35 U.S.C. 103(a) as being unpatentable over Millet et al. (WO 01/62662 A1 with English language equivalent US 6,929,668) in view of Deeke et al. (US 5,976,203).

Regarding claims 26, 28 and 30, Millet discloses a method which may be used for creating a mixture of hydrogen and carbon monoxide (see abstract), said method comprising:

a) producing hydrogen and carbon monoxide through a partial catalytic oxidation of at least one hydrocarbon with oxygen or a gas comprising oxygen, wherein said oxidation takes place (see claim 1 of Millet):

- 1) at a temperature less than about 1200°C (see claim 1 (a));
- 2) at pressure between about 3 bar and about 20 bar (see claim 1 (a)); and
- 3) in a first zone of a vessel (1);

b) recovering a gas mixture from said partial oxidation, wherein:

- 1) said gas mixture comprises hydrogen and carbon monoxide (see claim 1 (b));
- 2) said recovered gas mixture has a pressure between about 3 bar and about 20 bar (see claim 1 (d));

c) cooling said gas mixture by direct contact with water (see claim 2), wherein said gas mixture is cooled:

- 2) to a temperature between about -20 °C and about 80 °C (see claim 1 (c)).

While Millet discloses a preference for cooling the water quickly (i.e. "sudden cooling", see claim 2 and "flash cooling", col. 5 lines 9-13), Millet fails to disclose said partial oxidation and cooling is contained in a single vessel.

Deeke also teaches a partial oxidation method and apparatus that discloses the preference for rapid cooling (quench, see abstract) of partial oxidation gases immediately after combustion (see abstract).

Deeke teaches a first zone (combustion chamber, flow channel (3, 6)) which is followed immediately after by a second zone quench chamber (7) that is employed by a plurality of quench nozzles (9, 29) that distribute water onto the combustion gas in order to cool it (col. 3 lines 1-7). Deeke teaches this method and apparatus as a preferable method of cooling a partial oxidation gas (see abstract).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the partial oxidation apparatus and method of Millet and incorporate the single vessel design of Deeke with the water spray as a preferable way of quickly cooling (i.e. sudden cooling and flash cooling) the partial oxidation gases of Millet.

Furthermore, the modified Millet described above contains the second zone (quench chamber (7) of Deeke) and the first zone (combustion chamber (6, 3) of Deeke) in sequence, which results in immediate entry of partial oxidation gases into the second zone (i.e. 0 milliseconds).

Regarding claims 27, 33, and 34, Millet, as discussed in claim 26 above, further discloses said cooled gas mixture and recovered gas mixture have a pressure between about 3 bar (4 bar) and 20 bar (see claim 4 of Millet). Furthermore, process variables (i.e. temperature and pressure) are considered results effective variables and are not considered to confer patentability to the claim. As such, without showing unexpected results, the claimed process variables (i.e. temperature and pressure) cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized,

by routine experimentation, the temperature and pressure to obtain the desired results (In re Boesch, 617 F. 2d. 272,205 USPQ 215 (CCPA 1980)). Since it has been held that where general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (In re Aller, 105 USPQ 223).

Regarding claim 29, Millet, as discussed in claim 26 above, further discloses separating said cooled gas mixture to produce a hydrogen-rich gas stream (see claim 1(d)).

Regarding claim 31, Millet, as discussed in claim 26 above, further discloses said hydrocarbon is natural gas (see claim 3).

Regarding claim 32, Millet, as discussed in claim 26 above, further discloses said hydrocarbon is natural gas (see claim 3) and the CH₄/O₂ volumetric ratio is 1.5 to 2.1. Furthermore, process variables (i.e. reactant ratios) are considered results effective variables and are not considered to confer patentability to the claim. As such, without showing unexpected results, the claimed process variables (i.e. reactant ratios) cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the reactant ratios to obtain the desired results (In re Boesch, 617 F. 2d. 272,205 USPQ 215 (CCPA 1980)). Since it has been held that where general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (In re Aller, 105 USPQ 223).

Regarding claims 35, 41 and 42, while Millet, as discussed in claim 26 above, discloses oxidation taking place at a pressure between 3 and 20 bar (see claim 1 of Millet) and a temperature less than 1200°C (see claim 1 of Millet), Millet does not explicitly disclose a pressure between 6 and 12 bar or a temperature between 850°C and 1000°C. However, process variables (i.e. temperature and pressure) are considered results effective variables and are not considered to confer patentability to the claim. As such, without showing unexpected results, the claimed process variables (i.e. temperature and pressure) cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the temperature and pressure to obtain the desired results (In re Boesch, 617 F. 2d, 272,205 USPQ 215 (CCPA 1980)). Since it has been held that where general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (In re Aller, 105 USPQ 223).

Regarding claim 36, Millet, as discussed in claim 26 above, further discloses said gas comprising oxygen further comprises nitrogen (see claim 23).

Regarding claim 27, Millet, as discussed in claim 36 above, further discloses said gas comprising oxygen is air (see claim 24).

Regarding claim 38, Millet, as discussed in claim 26 above, further discloses a catalyst for partial oxidation formed by placing nickel on an inert support (col. 6 lines 42-52).

Regarding claim 39, Millet, as discussed in claim 26 above, further discloses said recovered gas comprises 30 vol% to 40 vol% hydrogen (col. 3 lines 40-48), 15

vol% to 20 vol% carbon monoxide (col. 3 lines 40-48), and trace impurities such as CO₂ and the remainder nitrogen (col. 3 lines 40-48).

Regarding claim 40, Millet, as discussed in claim 39 above, further discloses said recovered gas comprises 31 vol% to 34 vol% hydrogen (see claim 28 of Millet) and 17 vol% to 21 vol% carbon monoxide. While Millet does not explicitly disclose a carbon monoxide range of 17 vol% to 19 vol%, the claimed and prior art product(s) are identical or substantially identical and are produced by identical or substantially identical process(es). The burden of proof is on applicant to establish that the prior art product(s) do not necessarily or inherently possess the characteristics of the instantly claimed product(s), see *In re Best*, 195 USPQ 430.

Regarding claims 43 and 44, Millet, as discussed in claim 29 above, further discloses the hydrogen rich gas stream comprises about 99.9% to about 99.99999% hydrogen by volume (see claim 33 of Millet).

Regarding claims 45, 49, 50 and 51 Millet, as discussed in claim 29 above, further discloses said cooled gas mixture is separated by a TSA or PSA method where the TSA or PSA method is operated with at least two adsorbers operated alternately and when one adsorber is in regeneration phase, another is in production phase (see claim 40 of Millet). Furthermore, Millet discloses said separation method produces a hydrogen rich gas stream and a waste stream. Millet further discloses the separation method is a membrane permeation separation, which produces a hydrogen-rich gas stream and a waste stream containing nitrogen and carbon monoxide (see claim 41 of Millet).

Regarding claims 46 and 47, Millet, as discussed in claim 45 above, further discloses said waste gas is sent to a boiler and a cogeneration unit to generate electricity (col. 3 lines 63-64).

Regarding claim 48, Millet, as discussed in claim 26 above, further discloses removing at least a part of the carbon dioxide and stream impurities from said gas mixture in order to produce a gas mixture with controlled amounts of hydrogen, carbon monoxide, and nitrogen (see claim 38 of Millet).

Regarding claim 52, Millet, as discussed in claim 51 above, further discloses said waste gas stream comprises hydrogen (col. 4 lines 13-17).

Regarding claim 53, Millet, as discussed in claim 30 above, further discloses the elimination of soot from said cooled gas mixture (col. 6 lines 56-59).

Regarding claim 54, modified Millet, as discussed in claim 30 above, further discloses an accelerating means (inverted cone shape, see Deeke, Fig. 1) between said first zone and second zone.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J. Merkling whose telephone number is (571) 272-9813. The examiner can normally be reached on M-F 8:30-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1764

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



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